

application 11-94945, the number of pulses of the laser beam per unit time is changed depending on the speed of the vehicle or the distance to a measured object. Specifically, the number of pulses of the laser beam per unit time is set to a reduced value when the speed of the vehicle is equal to or lower than a prescribed value. The number of pulses of the laser beam per unit time is set to a reduced value when the distance to a measured object is equal to or shorter than a prescribed value.

Japanese patent application publication number 11-148974 discloses a distance measurement apparatus which transmits a train of pulses of a laser beam as forward pulses. When the forward pulses encounter an object and are reflected thereby, echo pulses occur correspondingly. The distance measurement apparatus of Japanese application 11-148974 includes a processor for detecting whether or not the amplitude of every received echo pulse is greater than a prescribed threshold value. The forward-pulse amplitude is increased as time goes by. During the increase in the forward-pulse amplitude, the processor detects a first received echo pulse whose amplitude exceeds the prescribed threshold value. The distance to an object is calculated on the basis of the detected first received echo pulse and the corresponding forward pulse. Immediately after the above-indicated first received echo pulse is detected, the forward-pulse transmission is suspended.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a distance measurement apparatus having a good response characteristic.

A first aspect of this invention provides a distance measurement apparatus comprising electromagnetic wave generating means for generating and transmitting an electromagnetic wave; scanning means for periodically changing a direction in which the electromagnetic wave is transmitted from the electromagnetic wave generating means; receiving means for receiving an echo wave caused by reflection of the electromagnetic wave at an obstacle; first driving means for repetitively driving the electromagnetic wave generating means a plurality of times per one period of the change of the direction by the scanning means, and thereby for causing the electromagnetic wave generating means to repetitively generate and transmit a distance measurement electromagnetic wave; first calculating means for measuring a time interval between a moment of every generation and transmission of the distance measurement electromagnetic wave by the electromagnetic wave generating means in response to drive by the first driving means to a moment of reception of a corresponding echo wave by the receiving means, and for calculating a distance to an obstacle on the basis of the measured time interval; second driving means for, before the first driving means drives the electromagnetic wave generating means, driving the electromagnetic wave generating means and thereby causing the electromagnetic wave generating means to generate and transmit a judgment electromagnetic wave having an energy smaller than that of the distance measurement electromagnetic wave; and obstacle judging means for judging whether an obstacle is present or absent

on the basis of conditions of reception of an echo wave
corresponding to the judgement electromagnetic wave by the
receiving means, for permitting the first driving means to drive the
electromagnetic wave generating means next in cases where it is
5 judged that an obstacle is absent, and for inhibiting the first driving
means from driving the electromagnetic wave generating means
next in cases where it is judged that an obstacle is present.

A second aspect of this invention provides a distance
measurement apparatus comprising electromagnetic wave
10 generating means for generating and transmitting an
electromagnetic wave; scanning means for periodically changing a
direction in which the electromagnetic wave is transmitted from
the electromagnetic wave generating means; receiving means for
receiving an echo wave caused by reflection of the electromagnetic
15 wave at an obstacle; first driving means for repetitively driving the
electromagnetic wave generating means a plurality of times per one
period of the change of the direction by the scanning means, and
thereby for causing the electromagnetic wave generating means to
repetitively generate and transmit a distance measurement
20 electromagnetic wave; first calculating means for measuring a time
interval between a moment of every generation and transmission of
the distance measurement electromagnetic wave by the
electromagnetic wave generating means in response to drive by the
first driving means to a moment of reception of a corresponding
25 echo wave by the receiving means, and for calculating a distance to
an obstacle on the basis of the measured time interval; second